

CLAIMS

What is claimed is:

1. A method for obtaining electronic images with a single imager of a substrate location and a component to be placed on the substrate location, said method comprising:
  - placing the component above the substrate location;
  - interposing a movable imager body between the substrate location and the component, the imager body including a moveable reflector;
  - moving the reflector to reflect an image from the component into the imager;
  - capturing the image of the component;
  - moving the reflector to reflect an image from the substrate location into the imager;
  - capturing the image of the substrate location; and
  - retracting the imager body from between the substrate location and the component.
  
2. A method for accurately placing a component on a substrate location, said method comprising:
  - picking the component;
  - transporting the component to a location above the substrate location;
  - interposing a movable imager body between the substrate location and the component, the imager body including a moveable reflector;
  - moving the reflector to reflect an image from the component into the imager;
  - capturing the image of the component;

moving the reflector to reflect an image from the substrate location into the imager;

capturing the image of the substrate location;

retracting the imager body from between the substrate location and the component; and

placing the component on the substrate location.

3. An apparatus for obtaining electronic images with a single imager of a substrate location and a component to be placed on the substrate location, said apparatus comprising:

means for placing the component above the substrate location;

means for interposing a movable imager body between the substrate location and the component, the imager body including a moveable reflector;

means for moving the reflector to reflect an image from the component into the imager;

means for capturing the image of the component;

means for moving the reflector to reflect an image from the substrate location into the imager;

means for capturing the image of the substrate location; and

means for retracting the imager body from between the substrate location and the component.

4. An apparatus for accurately placing a component on a substrate location, said apparatus comprising:

means for picking the component;

means for transporting the component to a location above the substrate location;

means for interposing a movable imager body between the substrate location and the component, the imager body including a moveable reflector;

means for moving the reflector to reflect an image from the component into the imager;

means for capturing the image of the component;

means for moving the reflector to reflect an image from the substrate location into the imager;

means for capturing the image of the substrate location;

means for retracting the imager body from between the substrate location and the component; and

means for placing the component on the substrate location.

5. A single camera system using up/down optics for component to substrate registration, said system comprising:

a placement machine;

a pick-up head transportable in X, Y, Z and T directions, the pick-up head for picking up a component to be placed at a selected location of the substrate;

an imager body including an imaging sensor mounted to the placement machine so that it can be disposed between a component held by the pick-up head and the selected location of the substrate and then withdrawn; and

a moveable reflector disposed on the imager body, the moveable reflector moveable between a position where an image of the component disposed above the imager body is reflected into the imaging sensor and a position where an image of the selected location of the substrate is reflected into the imaging sensor.

6. A single camera system in accordance with claim 5, wherein said imaging sensor comprises an area array-type imager.
7. A single camera system in accordance with claim 5, wherein said imaging sensor comprises a linear array-type imager.
8. A single camera system in accordance with claim 5, wherein said reflector is rotateable.
9. A single camera system in accordance with claim 8, wherein said reflector rotates in a range of about 45 degrees to about 225 degrees.
10. A single camera system in accordance with claim 9, wherein said reflector comprises a mirror having a reflective front surface.